CANADIAN ARCHITECT AND BUILDER.

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—THE—

CANADIAN ARCHITECT AND BUILDER,

A Monthly Journal of Modern Constructive Methods,

(With a Weekly Intermediate Edition—The CANADIAN CONTRACT RECORD),

PUBLISHED ON THE THIRD SATURDAY IN EACH MONTH IN THE INTEREST OF

ARCHITECTS, CIVIL AND SANITARY ENGINEERS, PLUMBERS, DECORATORS, BUILDERS, CONTRACTORS, AND MANUFACTURERS OF AND DEALERS IN BUILDING MATERIALS AND APPLIANCES.

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64 TEMPLE BUILDING, MONTREAL.

SUBSCRIPTIONS.

The CANADIAN ARCHITECT AND BUILDER will be mailed to any address in Canada or the United States for $2.00 per year. The price to subscribers in foreign countries, is $2.50. Subscriptions are payable in advance. The paper will be discontinued at expiration of term paid for, if so stipulated by the subscriber; but where no such understanding exists, will be continued until instructions to discontinue are received and all arrearages paid.

ADVERTISEMENTS.

Prices for advertising sent promptly on application. Orders for advertising should reach the office of publication not later than the 12th day of the month, and changes of advertisements not later than the 5th day of the month.

EDITOR'S ANNOUNCEMENTS.

Contributions of technical value to the persons in whose interests this journal is published, are cordially invited. Subscribers are also requested to forward newspaper clippings or written items of interest from their respective localities.

The "Canadian Architect and Builder" is the official paper of the Architectural Associations of Ontario and Quebec.

The publisher desires to ensure the regular and prompt delivery of this Journal to every subscriber, and requests that any cause of complaint in this particular be reported at once to the office of publication. Subscribers who may change their address should also give prompt notice of same, and in doing so, should give both the old and new address.

A DICTIONARY of Architecture has just been published which has been in course of preparation in England for more than forty years. With the exception of some twenty copies the edition which has been published has been sold to subscribers. As the work is said to be most authentic and complete, it is hoped a new and cheaper edition may be published.

THERE died in one of our Canadian cities recently a gentleman who delighted to call himself the friend of the widow and orphan. His will, which has just been admitted to probate, disposes of property valued at nearly half a million dollars, yet strange to say, not a single dollar thereof has been devoted to the benefit of widows and orphans or any other benificent object. It is to be regretted that so few bequests are made by men of wealth in Canada for charitable and educational purposes. It is true that some very handsome endowments have been made by wealthy citizens of Montreal to institutions in that city, notably the Royal Victoria Hospital and McGill University, but the number of philanthropists is by no means as large as it ought to be.

A BY-LAW respecting the construction of building scaffolds has recently passed the Toronto City Council. The by-law simply indicates the materials of which scaffolds should be built and stipulates the method of their construction. The City Commissioner is empowered to prosecute any person who may proceed with the erection of buildings using scaffolding which is not constructed in accordance with the by-law, or in the event of finding a scaffold which in his opinion is unsafe, any person who, after due notice, neglects to make the same satisfactory. The penalty for violation of the by-law is not to exceed $50 for each offence. It will be observed that the proposal urged upon the Council some months ago for the appointment of an expensive corps of scaffold inspectors has wisely been disregarded. The by-law in its present form will not be likely to prove very objectionable to builders.

AT the time of going to press, the city council of Toronto had not appointed a City Engineer. Unless Mr. Jennings could be induced to again take the position at his former salary, we doubt whether the Council will be able to appoint a more satisfactory man than Mr. C. H. Rust, at present acting City Engineer. Mr. Rust has been connected with the Engineering Department of the city for upwards of fifteen years. For several years he has had the entire charge of the construction of sewers, and in this capacity has done satisfactory work and proved himself to be possessed of the requisite executive ability. If Mr. Rust has given the city good service in the past, and is capable of filling the larger position, it would be unfair to give the appointment to an outsider. Should circumstances occasionally arise calling for engineering experience and ability of the highest order, the temporary assistance of an expert consulting engineer could be obtained. Such occasions are not likely to be frequent, and consequently should not involve large expense.

WE learn from the *Brickmaker* that there is much indignation expressed by Hudson River brick manufacturers over the action of the United States government in stopping French Canadians from going over the line to work on the brick yards under the Contract Labor Law. It has been the custom for years for these men to work in the brick yards during the summer, over 1,000 of them being employed every year. They spend most of their wages in the States, and before going home to work in the woods in winter lay in their supplies. The effect is, the manufacturers say, to cripple the yards, without benefilling the country, for the places of these men are gradually being filled by Arabs from the Holy Land who will carry the money paid them out of the country. The Alien Contract Labor Law, and some other measures recently enacted by the government of the United States, have to a large extent brought the statesmanship of the Republic into contempt before the world. Without attempting to detract from the many admirable characteristics of the American people, it can truthfully be said that as a nation, the United States has stooped to petty meannesses which no other country of importance on the face of the earth would be guilty of. In some instances the self

respect of the nation has been dragged in the dust by politicians anxious to make themselves and their party "solid" with certain vote controlling elements.

THE removal of St. Andrews Church, Toronto, from its present situation, at the corner of King and Simcoe Streets, to an up-town location, has been decided upon. No doubt, from the standpoint of the church's interest, the decision is a wise one. The building is situated at too great a distance from the modern residential part of the city, and in consequence, some of its members are forced to attend other churches. The removal of this church will deprive the city of a piece of street architecture which for nearly twenty years has stood an object of pride to the citizens and of admiration to visitors. The site on which the building stands was deeded to the trustees on the condition that a church would be erected thereon within a fixed period. When the limit of time had nearly elapsed a competition was held with the object of securing suitable plans for a building. The plans submitted by Mr. W. G. Storm, of Toronto, were chosen, and the building erected therefrom at a cost of $100,000. An illustration of the building, which is in the Norman style, is published in the present number. Tenders are now being asked for taking down the church and for its re-erection on a new site. It is estimated that the depreciation in the material would amount to about twenty-five per cent. It is not the intention we understand in re-erecting the building to make any alteration in the design. It is to be hoped that proper care will be taken to select a site which will display to not less advantage than at present its beauty of design.

CANADIANS should make the most of the opportunity afforded by the approaching World's Fair to make known to the world the capabilities of this country and its people. We are pleased to notice that in agricultural, manufacturing and other lines, steps are being taken in this direction. It would seem pertinent to enquire what will be done to show the status of Canadian architecture. The desirability of making a Canadian architectural exhibit will hardly be questioned. Such an exhibit would tend to attract to Canada persons of refinement, many of whom have been imbued with prejudice against it in consequence of misconception regarding its climate and the status of its civilization. Canadian architects should lose no time in preparing for this exhibit designs which should exemplify their best talent. They should be sufficiently patriotic to devote whatever time and money may be necessary for this purpose. So far as time is concerned, the prevailing dullness has left many members of the profession with abundance of leisure which could not be used to better advantage. We are pleased to be informed that some prominent members of the profession in Toronto have already decided to exhibit their work either individually or in conjunction with other exhibitors, as circumstances may direct. It will of course be necessary to decide the conditions under which the exhibit should be made; that, however, is a matter of future arrangement. As the preparation of suitable drawings may be presumed to occupy several months, it is very desirable that a commencement should be made at once.

A COMPETITION was instituted last year for designs for an Episcopal Cathedral to be erected in Victoria, B. C. The limit of cost was fixed at $150,000, a sum very inadequate for the purpose. The competition closed on the 31st of December last. The competitors numbered fifteen or sixteen, and were almost equally divided as between English and Canadian architects. Three prize were offered, the first being $750 and 5 per cent commission on the cost of carrying out the work; the second, $500, and the third $250. Sir Arthur Blomfield was appointed to judge the designs. His award has just been announced. The first prize is given to Messrs. Evers & Keith, of Victoria; the second and third prizes will, it is said, go to two of the English competitors whose names have not yet been disclosed. The Canadian competitors, being situated at such a distance from the place of award, had two weeks less time than their English competitors in which to prepare their drawings. In consequence, some of the Canadian designs had to be forwarded in an incomplete condition. The accepted design is said to be in the style of the XIII century. The total length is 236', height of spire, 275', internal height of ceiling of nave 72'. The cross has been retained as the basis of the plan, the transepts being shallower than in most of the old examples. The tower has been placed in the centre of the west front. On the east side of the east gable rise two turrets 93' in height. The walls will be of stone with cut stone finish, ceiling of cedar and roof of slate. The total seating capacity is 1468, 3'3" x 1'1'⅛, being allowed for each person. The enterprise may be regarded as an English rather than a Canadian one, as it is understood that two thirds of the cost will be defrayed out of subscriptions of well known English philanthropists.

SCIENTIFIC men and the general public have indulged the belief that of late sanitary science has been making satisfactory progress. In his paper on "The Free and Liberal Ventilation of Sewers in its Relation to the Sanitation of our Dwellings," read before the Royal Society of Canada, on May 31st last, Mr. Chas. Baillairgé, City Engineer, of Quebec, puts himself squarely in opposition to some of the most important doctrines of modern sanitarians. He says: "A host of unemployed would-be-scientists in each city, are constituted a 'Board of Health,' elect a President, Vice-Presidents, Secretaries, Treasurers; appoint health officers, inspectors, etc., and this galaxy of hygienists, to give themselves an air of public usefulness, prove over zealous in clamoring against the falsification of alimentary substances, in advocating and filtering of water, in conjuring up microbes, bacteria and contagious diseases, in battling for vaccination, disenfection, ventilation and the like. They fancy they are serious and in the end become so, and would convince people that a thousand precautionary measures are at present indispensable, of which no one ever dreamed in the past, and without in any way suffering therefrom." And again: "let me say in one word, to have done with these preliminaries, and show that in many cases, the evil is not nearly as great as it is said to be, that while we are crying out for ventilation, nine tenths of the human race do without it and appear to be none the worse for ignoring it. A thousand precautions are sought to be enforced in the drainage of our houses. Thousands of towns and villages, the wide world over, ignore the thing entirely and live quite as long as those who at such great cost give themselves the luxury of sanitary modes of removing their excreta; and during epidemics, as during normal times, there is no more, no less sickness, there are no fewer, no less deaths in the one case than in the other." These opinions, from which most persons will feel inclined to dissent, are to some extent modified by those following, in which the importance of providing for the exclusion of sewer gas from dwellings is discussed.

CHARACTERISTICS OF ARCHITECTURAL STYLE.

By G. F. STALKER.

SINCE the Queen Anne revival, and to a large extent on account of it, there has been more energy and individuality displayed in the architecture of Great Britain, her colonies and America, than has been the case in any similar period of the world's history. It is a noticeable fact at the same time, and probably also attributable to the same cause, that during this time style in architecture has got somewhat mixed. The misfortune in regard to the Queen Anne revival was not on account of any lack of genius on the part of the architect who was the chief mover in it, but that the Queen Anne style (if style it may be called) was esssentially debased and impure. During the latter part of the reign of Queen Anne, when the kind of building which bears her name was in vogue in all its pristine impurity, architecture was at as low an ebb as it well could be. The knowledge of art, in any of its branches, had departed; but the belief that Rome was the mother of art and Italy its home, possessed the minds of the people; and consequently nothing that had not a smattering of Roman or Italian art would pass muster. And, as generally happens under such circumstances, the least pure features of the Italian renaissance, with its broken backed, curved or twisted tympani, its disproportioned mouldings and obtrusive carving, were copied and stuck on to buildings in England, without any regard as to fitness or congruity. And in these latter times the absurdities, and the outgrowths of the ignorance displayed in the days of Queen Anne have come to be looked upon as quaint, piquain, or artistic architectural adornments. But there is properly speaking, no style in them. A cool headed architectural critic would pass over the Queen Anne period without the slightest notice. A much better revival and one more likely to be lasting, is the Norman. This is often but most erroneously called "the modern Romanesque," but there is nothing Romanesque in it, excepting that the semi circular arch is used, and this was also the dominant feature of the Norman. Everything else in this revival is peculiarly Norman, and consequently it is based upon a style of great purity. Herein, then, lies the great difference between the two. In the latter, modern architectural expression has been founded upon a distinct language, in the former it rests on a poor kind of patois. These two revivals are noticed here merely to show the effect that a clear knowledge of architectural style will have upon any attempt which may be made to found a new development, or departure, in architecture, upon any style which has previously existed. To take as a model the class of buildings that were erected at a time when architectural knowledge was meagre, and the outcome of it in consequence debased, may create a fleeting fancy, but will have no lasting beneficial effect on architecture. While, on the other hand, to take as a model a period when architecture was studied and practiced as a fine art, the result cannot fail to have a good and permanent influence.

The question of inventing a new style of architecture is often raised by unlearned men; and architects are often taunted with the fact that they are unable to accomplish this object. But then no man ever did invent a style of architecture or a language. They are both the growth of centuries, having in them the distinctive marks of the people amongst whom they have sprung up, and have been developed and perfected, but bearing also upon them traces more or less definite, of international influence. It is, therefore, no disgrace to a young country like Canada, that she has not yet reached that fulness of architectural stature, to claim for any of her buildings a truly

and distinctly national character. At the same time, the tendency of architects in the Dominion is happily in this direction. And this being, the case a consideration of the characteristics of architectural style may not, at the present time, be deemed inopportune or unimportant. It is a matter of uncertainty to fix the dates of some of the older buildings of the world, or even to be very positive in asserting what nation has the first claim to have had a national style. On these points the doctors disagree, but the majority of writers are of opinion that, in the architecture of Egypt, we are taken further back in the history of the world, than in that of any other nation. It is now known, beyond question, that some of the pyramids were erected at least 3000 years B. C., and when the great mechanical ingenuity displayed in these wonderful structures is taken into consideration, together with other evidences of the high state of civilization the Egyptians had attained at that early period, we are absolutely at a loss to ascertain how far back their history as a nation extends. For the purpose of this paper, however, it is sufficient to start with the pyramids, as the earliest architectural monuments known to us in the world.

In these, as in all other buildings which have been discovered in Egypt, the great predominating feature is mass. The Egyptians were essentially builders, and they built for eternity. It is nowhere found in any of their buildings, not even in the tombs or temples, that the details are emphasized in such a way as to detract from the massiveness of the whole composition. Simplicity and stability were with them of the first importance, and where ornament and color were introduced, their introduction did not in any way lessen the sombre grandeur, or the eternal purpose of the structure. But being kept in subjection and painted or carved with remarkable fidelity and truth, they served the double purpose of affording relief to the eye, and giving scale to the buildings.

In many of the chambers of the pyramids, and particularly in the tombs and temples, color was freely used ; not as an after thought, (as decoration is arranged for in our own day) but as an essential part of the original design. And though the colors were always brilliant and lustrous, the general harmony was maintained so perfectly that the effect was always pleasing. The subjects chosen for these mural paintings were generally scenes from their daily life ; and so from these we have a more accurate history of this people than we have of many nations that came into existence when ancient Egypt had almost or altogether disappeared. Sculpture also, was very largely used, and wherever it was applied, like painting, it formed part of the original conception. And these sculptural representations may always be taken to be most faithful portrait. No flattering touches were permissible. The sculptors were required to adhere most sorupulously in every line and feature, to an exact representation of the original. Some writers on Egyptology even go so far as to assert that rigid accuracy both in painting and sculpture, wherever the human form was concerned, was not so much an artistic as a religious necessity. In the more strictly architectural ornamentation of their columns, doorways, cornices and other portions of their buildings, however, although their ornament was generally based upon natural objects immediately at hand, it was invariably conventionalized. And when color was applied in these cases, it was so arranged as to contribute to the harmony of the whole composition.

The remarks which have been made have reference, as any one may see, to the great public buildings of Egypt. But with regard to the domestic architecture of the country, very little is known. Even from the solitary example now remaining at Medinet Habou (this being a royal pavilion) we can form only a faint idea of the general character of their domestic work. But we can well imagine that the people who erected, with such taste and skill, pyramids, temples, tombs and palaces, which were intended to defy the destructive forces of time, must have exhibited the same refinement in their domestic work, although they may have built their houses with more perishable materials.

A very singular and noticeable fact with regard to Egyptian architecture, is the continuance of the national features and characteristics of the style right on until the time when it may be said that Egypt ceased to build. The Egyptians were conquered by the Greeks and afterwards by the Romans, two great building nations, but, unlike any other people who fell under their domination, their influence on the architecture of Egypt is nowhere visible. Many great and notable buildings were erected both under the Greeks and the Romans, but they were carried out in every detail just as if neither Greek nor Roman had ever seen Egypt. This is very strong evidence that those two great peoples saw in the architecture of the country they had conquered, its absolute suitableness to that country, for, though they both imitated and grafted on to the styles which bear their names, features essentially Egyptian, they left the architecture of the country, during the period of their occupation, altogether untouched.

Following the Egyptian period, in point of antiquity, we reach the Chaldean, in which, however, must be included the Assyrian and Persian styles. The oldest buildings of these people so far as can be ascertained, date back to about two thousand five hundred years before the Christian era. Unfortunately the materials used were mostly of a very perishable nature, such as wood and sun-dried bricks, so that the remains of them are, in most instances, nothing more than heaps of shapeless ruins. But during the reigns of the Assyrian and Persian monarchs, more durable materials were manufactured or imported, and then many palaces and a few temples were erected of gigantic dimensions, and in all the gorgeousness of eastern show and splendour. Symbolism and allegory, having always been the most natural expression of the mind of the western Asiatic, are, in the Chaldaic buildings, employed to their fullest extent. As a necessary consequence they aremore decorative than architectural, in the strict sense of the word, always gorgeous, though sometimes having a leaning to the barbaric. Some of the architectural forms they invented, were, however, turned to good account by the Greeks, and are better known to us in their European than in their Asiatic dress. At the same time the remains which have been, and which, it is to be hoped, will yet be discovered and explored (such Nineveh, Persepolis, etc.) must always be of vast importance and interest, although more to the historian than to the architect.

Unfortunately, the Jews had no style of architecture whatever that they could call their own. The greatest buildings that were erected in Judea, even during the time when they endeavoured to mark their prosperity and importance on the history of the world, were the conceptions of foreign architects, and the execution of foreign builders. Probably this is due to their too literal interpretation of the second commandment. But whether this is the case or not, the fact remains the same, that there is nothing essentially Jewish to be found in the whole history of architecture.

ONTARIO ASSOCIATION OF ARCHITECTS STUDENTS EXAMINATIONS.

In response to a number of requests we publish below the examination papers used in the above examinations :—

Practical Knowledge of Building Trades.

FINAL.

APRIL 5TH.

MR. E. BURKE, *Examiner.*

NOTE : *120 Marks will be the maximum number possible to be obtained and 60 per cent. the minimum to pass.*

Values.

10 1. Name a simple method of "squaring" in laying out the lines for the erection of buildings. What are "batter boards"? and what is their use?

15 2. Draw to a scale of ½" to the foot, a section of a cellar wall of rubble stone 18" thick, showing proper construction, with footings and methods of keeping the walls dry and of removing water of soakage and springs. Write explanatory descriptions.

15 3. Draw to scale of ½" to the foot, to carry an iron column, a brick pier 2' 3" square, 8 ft. high, with double footing course. Show also plans of two consecutive courses of the brickwork. Wood beams 10"x12" will rest upon two sides of the pier, one foot below the top, in such a manner as not to weaken it.

15 4. In constructing a heavy tower wall of stone, in connection with a lighter stone wall abutting upon the same, what precaution should be taken to prevent unequal settlement which might occur even when the footings are properly proportioned to sustain the superimposed load.

12 5. What is underpinning? and how done? Give explanatory sketch. How would you support a brick wall when inserting a breastsummer? Show sketch with explanatory remarks.

12 6. Indicate the construction ⅛ size of the joint of an 8" cast iron pillar of x section set upon a cylindrical pillar of cast iron 9" diameter. The latter also carries two beams 8"x12".

12 7. Draw ⅛ size proper method of superimposing wood posts carrying beams, so that the latter may burn or fall out without endangering the whole building. Show also connections of beams to walls with the same object in view.

15 8. Draw section to ¼ scale of a Queen Bolt Composite roof truss of 50 ft. span and pitch of 30 to 40 degress. Show details ⅛ size. Indicate parts in compression and tension.

20 9. Indicate construction of iron floor beams and posts showing method of fire proofing.

15 10. Show approved construction of a first class veneered door. Show to an inch scale a horizontal section of a boxed window frame with inside folding blinds in boxes.

10 11. Describe and sketch two methods of forming valley and hip flashings. Also method of flashing a slate roof of ½ pitch at a parapet wall.

15 12. Describe three coat plastering, mentioning points in regard to each coat. How should successive coats of paint be treated to gain a proper surface. Show a section of the leads in lead glazing and method of inserting and holding glass.

Strength of Materials.

FINAL.

NOTE : *100 marks count a full paper.*

Values.

15 1. What would be the proper Form of Cross-Sections for a Beam of (*a*), cast iron ; (*b*), wood ; (*c*), rolled steel ; giving your

reasons in each case. Explain the circumstances governing the selection of a factor of safety in each case.

15 2. Explain fully what is meant by the following terms : (*1*), Beam ; (*2*), Short Post ; (*3*), Long Post ; (*4*), Cantilever ; (*5*), Strut ; and (*6*), Tie-rod.

10 3. Explain at length what is meant by (*a*), Shearing Force ; (*b*), Bending moment at a vertical cross-section of a beam.

10 4. How are the Normal and Shearing Stresses distributed over the vertical cross-section of a uniformly loaded horizontal wooden beam.

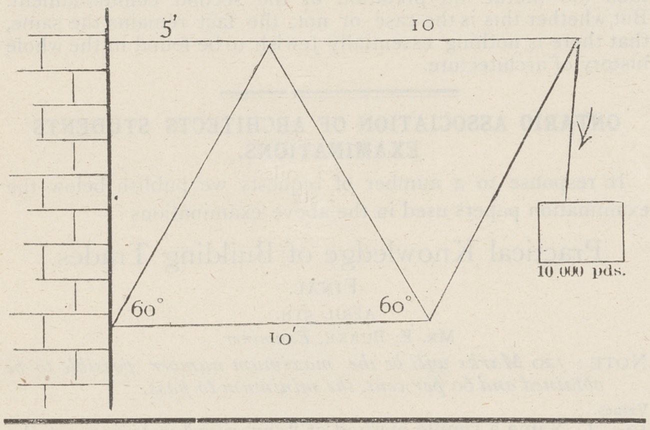
15 5. Explain the principle governing economy of material in bolts and rivets. Find the pitch of the rivets in a plate butt-joint, with a pair of cover plates, double rivetted in terms of the diameter of rivet and thickness of plate.

20 6. What is meant by the terms : Modulus of Elasticity and Limit of Elasticity. Explain fully.

10 7. State clearly the various conditions upon which the strength of posts depends which are long enough to be liable to flexure.

15 8. State and explain the equations of equilibrium for forces acting on a rigid body in one plane.

20 9. Calculate the Stresses in the following truss : (*a*), Analytically ; (*b*), Graphically.



Structural Ironwork.

SECOND INTERMEDIATE.

APRIL 6TH.

MR. E. BURKE, *Examiner.*

NOTE : *100 marks will be the maximum obtainable and 50 per cent. the minimum to pass.*

Values.

10 1. Draw a section ⅛ full size of a flitch-girder, the timber for which was taken from a piece of 10"x12" stuff. Write description and comments.

5 2. What is the best description of iron for beams? Give reasons.

10 3. Draw a section ⅛ full size of a cast iron lintel or beam 8" deep and indicate portions which are in compression and which in tension.

10 4. Draw a section ⅛ full size of a rolled iron girder 12" deep. Show connection of 9" wrought iron beam, both the bottom flanges being level.

10 5. Draw a section to 1" scale of a one and one half brick wall carried on **I** beam.

12 6. Indicate by a sketch ⅛ full size such a method of anchoring a 10"x12" wood beam to an 18" brick wall, that the wall will not be pulled over should the beam drop out by burning or otherwise.

10 7. Draw a section to scale of cast iron columns of **H** & **X** pattern and name the parts, with comments.

10 8. Draw section ⅛ full size of connection of a 9" diameter cast iron column to cap and base plates and name the parts, with comments.

10 9. Draw sections ⅛ full size of 8" diameter, rectangular and octagon columns built up from rolled iron plates or bars.

15 10. Draw to a scale of 4 ft. to the inch an iron roof truss of ¼ pitch 25 ft. clear span between brick walls. Indicate members in compression and tension.

12 11. Draw to a scale of 4 ft. to the inch a trussed breastsummer formed with 4 pieces of 3x12 joisting, having a clear span of 15 ft. and a space of 2 ft. from top of beam to underside of window sills above.

12 12. What is understood by the terms washer, nut, upset ends to tension rods, torsion, core, cold shot. Draw or describe.

History of Architecture.

FIRST INTERMEDIATE.

THURSDAY, APRIL 7TH.

NOTE : *The Candidate is expected to answer three of the following questions. Drawings are to be neat and to a scale of not less than ½ an inch to 1 foot but they are not required to be finished. The scale used must be mentioned.*

1. Sketch, in outline, the Orders of Classic Architecture ?
2. In what country was the Arch first used as a feature in Architecture ?
3. Name the various styles of Architecture since the introduction of the Arch down to the present day.
4. Describe and illustrate by sketches the leading features of each of these styles.
5. Give an approximate date for each of these styles.

SECOND INTERMEDIATE.

THURSDAY, APRIL 7TH.

NOTE : *Drawings are to be in outline only, neat and well arranged and are not required to be finished. The scale should be not less than ½ an inch to the foot. The scale used must be mentioned.*

1. Draw the Grecian Orders.
2. Draw the Roman Order.
3. What do you understand by the term Romanesque Architecture.
4. Illustrate by drawings the characteristics of Norman, Early English, Decorated and Perpendicular styles of Architecture.

FINAL.

THURSDAY, APRIL 7TH.

NOTE : *The Candidate is expected to answer questions Nos. 4, 8, 9, 10, 14. Additional marks will be given for additional answers. Drawings are to be in outline only and are not required to be finished. The scale should be not less than ½ an inch to 1 foot and must be mentioned where used. It is to be borne in mind that it is not the drawing so much as what the drawing indicates of the Candidate's knowledge, that is required. But neatness of drawing and good arrangenent will be taken into consideration.*

ANCIENT ARCHITECTURE.

1. What country may be called the birthplace of Architecture.
2. Through what countries is the history of Architecture to be traced prior to the rise of the Greeks as a nation.
3. Give an outline of the history of Architecture in these countries.

NOTE : *The Candidate is expected to answer one of the above questions.*

GRECIAN AND BOMAN.

4. Name and draw in outline *only* the Orders of Greek Architecture and give an approximate date for each.
5. Draw in outline only the plan and front elevation of a Greek Temple in any order.
6. Explain illustrating by sketches the development of the Ionic Capital.
7. Mention one Greek Temple in *each* Order.
8. Draw the Roman Order.

ROMANESQUE.

9. Sketch the leading characteristics of Romanesque Architecture.

GOTHIC.

10. Sketch a portion of a nave in Norman Early English Decorated and Perpendicular giving the date of each style.
11. What is the practical use of the flying buttress and of the pinnacles?
12. What is "Flamboyant" Architecture ?
13. What do you understand by Renaissance Architecture ?
14. Describe the main characteristics of the style you have chosen illustrating them by sketches in outline. Give a portion of the plan of a building in this style, sufficient to show the characteristics ; give a section of the roof shewing the form of vaulting, shew the form of the windows, arcading and any other feature specially illustrative to the style.

Mouldings, Features & Ornaments.

FINAL.

APRIL 7TH.

S. H. TOWNSEND, *Examiner.*

NOTE : *150 marks will be considered a full paper.*

Values.

15 1. Show by a diagram how you would arrive at the entasis of a Doric Column.

20 2. Sketch a Triglyph, and show in what way the Greek and Roman examples differ.

25 3. Draw to half inch scale a Greek Conic Capital, and sketch some of the ornament to a larger scale.

15 4. Sketch a "trussed rafter" roof.

15 5. What are Cusps? during what period were they first introduced. Sketch two examples, one of early and one of late date, and point out the main points of difference between them.

30 6. What are the general characteristics of the mouldings of the period you have sketched, give examples showing how they differ from the periods immediately preceding and following.

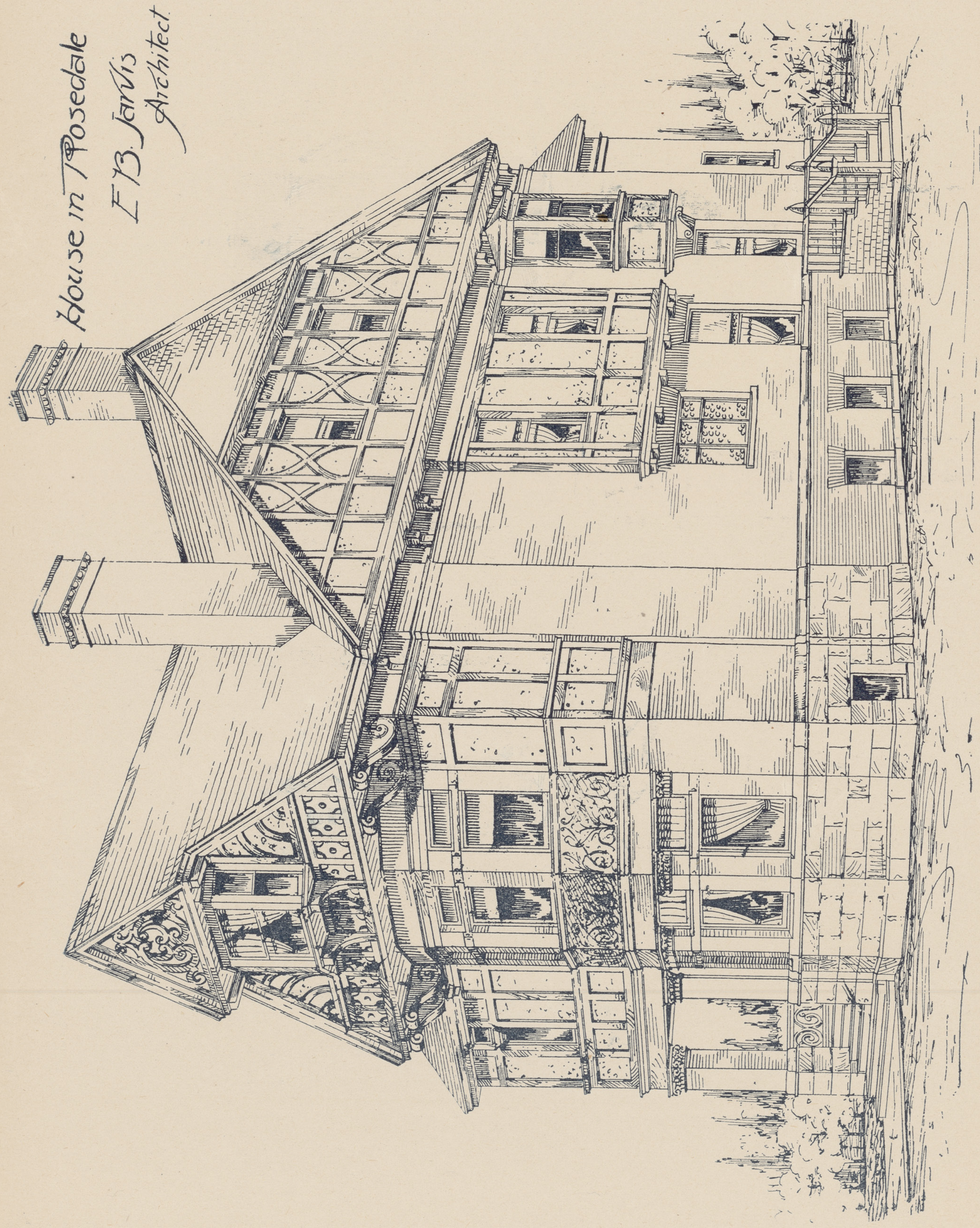
20 7. Sketch to a scale of ¼ of an inch to the foot, one of the buttresses against the side wall of an Early English Church, to be 21 in. wide on face, to project 36 in. at the base, and to have three weatherings. Height from the ground to the underside of the eaves cornice twenty feet.

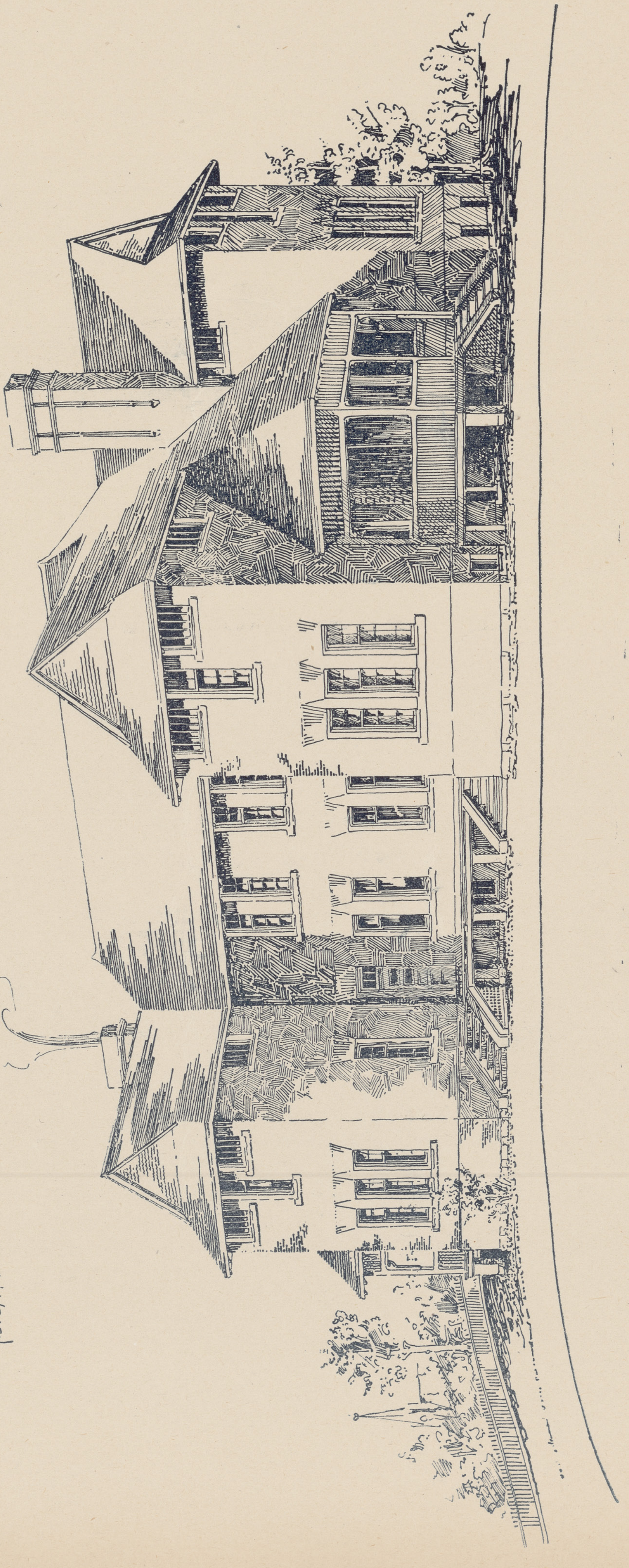
10 8. What do you understand by plate-tracery? In what styles was it used. Give examples.

15 9. Sketch some foliated ornament in the style you have selected.

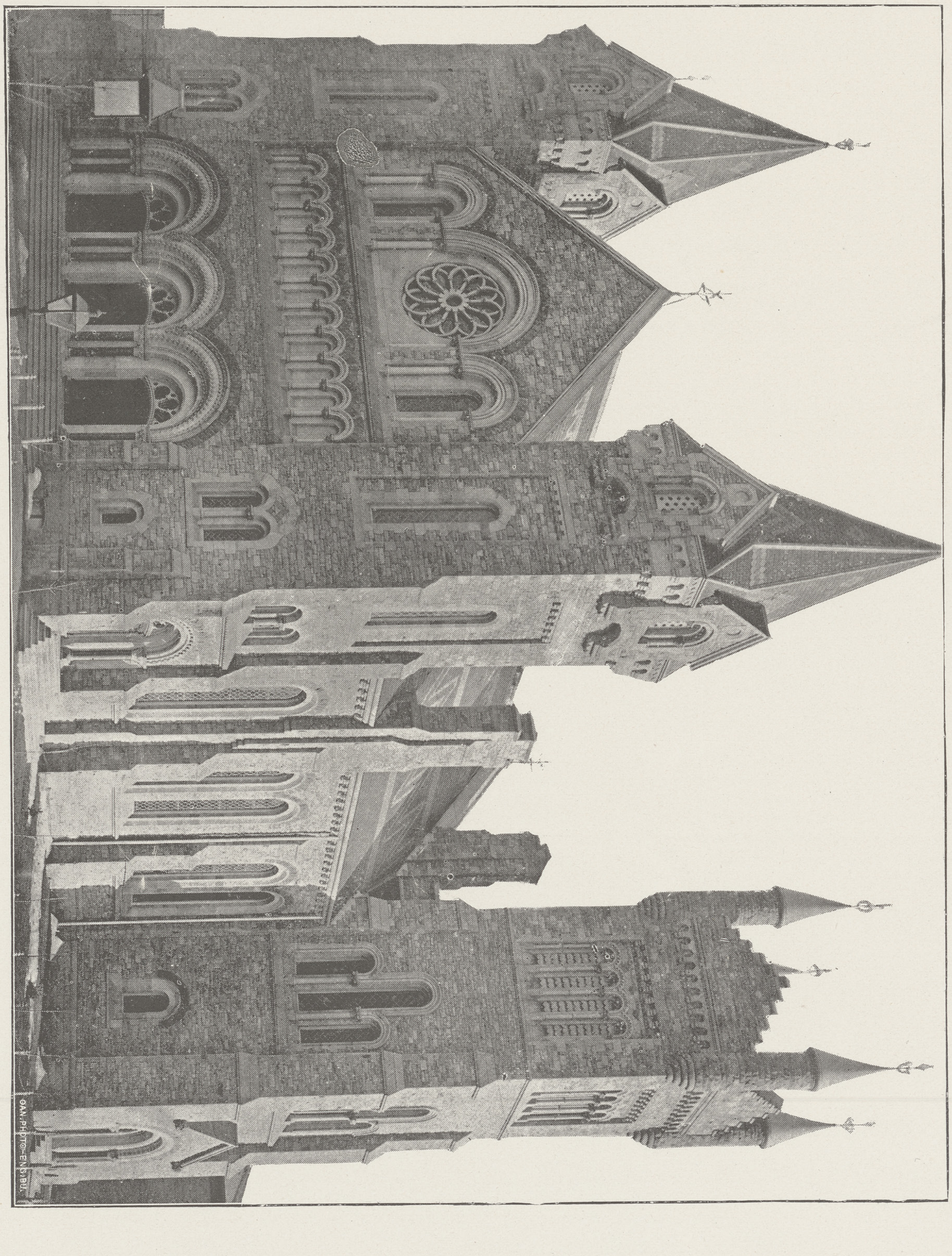
25 10. Sketch two examples of string-courses in the Norman, Early English, Decorated and Perpendicular styles. One ex-

THREE RESIDENCES ON DORCHESTER ST. W, MONTREAL; FOR J. SHEARER; CORNER HOUSE FOR J. BROWN. WRIGHT & SON ARCHITECTS. MONTREAL.


House in Rosedale
F.B. Jarvis
Architect



ALEXANDRA · SCHOOL · FOR GIRLS
at EAST · TORONTO
Henry Simpson Architect
9½ Adelaide St. E.
Toronto



St. Andrew's Church, Toronto.
W. G. Storm, Architect, Toronto.

ample in each style to be placed under the ground floor windows of a college building and the other at a height of twenty feet from the ground over the main entrance doorway.

30 11. Sketch a doorway in the style you have selected, giving Plan, Elevations, and section through jamb and head.

Algebra.

FIRST AND SECOND INTERMEDIATE.

NOTE : *100 marks will be considered a full paper.*

Values.

15 1. Simplify

(*a*) $$\cfrac{x}{1-\cfrac{x}{1+x+\cfrac{x}{1-x+x^2}}}$$

(*b*) $$\frac{a^2}{(a-b)(a-c)}+\frac{b^2}{(b-a)(b-c)}+\frac{c^2}{(c-a)(c-b)}$$

(*c*) $$\frac{x+y}{y}-\frac{2x}{x+y}+\frac{x^3-x^2y}{y^3-x_2y}$$

15 2. Two numbers differ by two. Show that the difference of their squares is twice their sum.

20 3. Solve the equation $ax^2+bx+c=o$. If α, β are the roots of this equation prove $\alpha+\beta=-\frac{b}{a}$ and $\alpha\beta=\frac{c}{a}$

20 4. Solve the equations :

(*a*) $x-y=1$
$xy=12$

(*b*) $\frac{x+3}{2}-\frac{x-2}{3}=\frac{3x-5}{12}+\frac{1}{4}$

15 5. Factor :

(*a*) $a^2+b^2-c_2-d^2-2ab+2cd$.

(*b*) $a^2+9ab+20b^2$.

(*c*) $bc(b-c)+ca(c-a)+ab\,(a-b)$.

20 6. State and prove the rule for finding the Highest Common Factor of two numbers.

10 7. Find the Least Common Multiple of x^2+2x-3 ; x_3+3x_2-x-3 and x^3+4x^2+x-6.

15 8. In a mixture of wine and water the wine composed 30 gallons more than half of the mixture and the water 10 gallons less than a third of the mixture ; how many gallons were there in each ?

Trigonometry.

FIRST AND SECOND INTERMEDIATE.

NOTE : *100 marks will be considered a full paper.*

Values

15 1. (*a*) Define an angle according to the usage of Plane Trigonometry.

(*b*) Define the common units of angular measure.

(*c*) Express in sign and magnitude in any two of the units, the angle described by the minute hand of a clock between the times 9h. 05m. and 11h. 25m.

20 2. (*a*) Explain fully the meaning of $\sin A$, $\cos A$ $\tan A$, and $\sec A$.

(*b*) Discuss the changes in them as A changes from 0° to 360°.

15 3. Prove the foll.—

$$\tan A = \frac{\sin A}{\cos A}$$

$$\sin_2 A + \cos^2 A = 1$$

$$\sin(A-B) = \sin A \cos B - \cos A \sin B$$

10 4. Express the other trigonometrical ratios in terms of the tangent.

15 5. Prove the foll.—

$$\sin(\alpha+\beta)\sin(\alpha-\beta) = \cos_2\beta - \cos^2\alpha$$

$$\sin A = 2\sin\frac{A}{2}\cos\frac{A}{2}$$

20 6. What is the logarithm of a number ? Of what use are logarithms ? Prove the statements you have just made.

15 7. Prove $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

15 8. Given $a = 47.97$, $b = 54.23$ and $A = 57°34$. Find B, c and C.

NUMBER	MANTISSA	RATIO	L
5423	.734240	sin 57°—34′	9.926351
4797	.680970	sin 72°—35′	9.979618
		sin 72°—36′	9.979658
4344	.637890	sin 49°—50′	9.883191
4345	.637990	sin 49°—51′	9.883297

Euclid.

FIRST AND SECOND INTERMEDIATE.

PART 1.

1. (*a*) Triangles upon the same base, and between the same parallels, are equal to one another.

(*b*) E is a point in the side AC of a triangle ABC. Construct a triangle $ECBD$ equal to ABC.

2. If a straight line be divided into any two parts, the square on the whole line is equal to the squares on the two parts together with twice the rectangle contained by the parts.

3. The angle at the centre of a circle is double of the angle at the circumference subtended by the same arc.

4. The opposite angles of any quadrilateral figure, inscribed in a circle, are together equal to two right angles.

FIRST AND SECOND INTERMEDIATE.

PART 2.

5. If a side of any triangle be produced, the exterior angle is equal to the two interior and opposite angles, and the three interior angles of every triangle are together equal to two right angles.

6. In any right angled triangle the square which is described on the side subtending the right angle is equal to the squares described on the sides which contain the right angle.

7. To describe a square that shall be equal to a given rectilinear figure.

8. The bisections of the three angles of a triangle meet in one point.

Foundations.

FINAL.

Values.

10 1. Name one of the best soils for building upon. Is it safe to build upon a clay soil ; state your reasons for the answer you give.

11 2. In building upon a soil which has not level strata or which has portions of clay or loose gravel, what should be done to prevent uneven settlements.

15 3. Where the foundations of a building are not at the same level what means should be taken to prevent uneven settlement.

20 4. If you were putting in the foundation of a building and came upon a soft piece of ground what would you do to obtain a good foundation and prevent uneven settlements ?

20 5. What is meant by the detached pier system of foundations ; when should it be adopted and what are its advantages ?

20 6. In putting in foundations for a building what means would you take to prevent uneven settlements on the part of the supporting soil.

15 7. What are sand piles and under what conditions is it advisable to use them ?

10 8. What would be safe load to place upon a good hard clay soil ?

20 9. What should be done to make a safe foundation where the soil is running sand ?

10 10. Enumerate some of the different forms of piles.

20 11. How would you obtain a large surface support for a building where it is impossible to obtain such a support in the ordinary way by projecting the footing courses.

20 12. Is it advisable to use inverted arches in foundations ; if so under what conditions ?

20 13. State the proportions of a good concrete for filling trenches under foundation walls.

10 14. Should concrete be placed in the trenches or should it be thrown in from a raised platform.

Architectural Jurisprudence.

FINAL.

APRIL 7TH.

S. H. TOWNSEND, *Examiner.*

NOTE : *100 marks will be considered a full paper.*

Values.

20 1. The penalty clause in contracts as it is usually termed, provides that in the event of the Contractor's failure to complete the work, or building to be executed, within the stipulated period he is to forfeit and pay to the employer a specified sum per day or per week, for each and every day or week as the case may be which shall elapse between the stipulated and actual date of completion. The sum of money so forfeited by the Contractor is sometimes spoken of as a "penalty," although in most contracts it is expressed to be as "liquidated damages." Distinguish between these two terms, and give a simple illustration of the difference.

25 2. Does the approval by the client of the drawings and specifications estop him from afterwards alleging that the Architect has failed to exercise proper skill in the preparation of these documents ? If so, to what extent ? and in regard to what matters ?

20 3. What are "torts ?" Do you know of any law or rule of the courts in regard to tort-feasors, liable to effect the liability of an Architect to parties other than his client ?

25 4. State what you know of the responsibilities an Architect incurs in the event of the failure of buildings constructed from his drawings and under his supervision, and say to what extent these responsibilities are shared by the builder and owner.

10 5. State what you know of the relative effect of progress and final certificates.

30 6. A contract provides that the certificate of the Architect shall be a "condition precedent" to payment, and that his decision shall be final, and further that the contractor must obtain written orders signed by the Architect for extra work before such work is commenced. (*a*) What is meant by a condition precedent? (*b*) If the Architect includes in his final certificate extra work for which he is not given a written order or work which has not been properly executed, must the proprietor pay the full amount certified for? If so, why so? If not, why not? (*c*), What will be the effect to the builder if the Architect refuses to grant him a final certificate. I Because he honestly believes the work to be improperly done, when as a matter of fact the work is done in a manner that would be accepted by another Architect. II Because the proprietor told him he had not the money to meet a certificate, and induced him to delay granting the certificate in consequence.

20 7. To what extent has an Architect power to order changes in the work shown by the drawings and specifications? If for instance the drawings and specifications showed that the foundations were to be piled, and the contract provided that the contractor was to make such additions or omissions as the Architect directed, and the Architect finding piling unnecessary directed the builder to build the building without piling—would the court recognize this order? Or if the Architect considered a wall specified to be built of brick would be better if built of stone, would he be justified in ordering the change without the express assent of his client? If he did order it, without such consent, would the court recognize the order?

Heating and Ventilation.

FINAL.

HEATING.

Values.

25 1. Name the different ways in which heat may be transmitted and explain clearly how heat is given off in each case.

30 2. (*a*) State the advantages and disadvantages of hot air heating.

(*b*) State the advantages and disadvantages of hot water heating.

(*c*) State the advantages and disadvantages of steam heating.

20 3. In what position should a hot air furnace be placed in relation to the rooms to be heated?

20 4. What precaution should be taken in the running of the hot-air pipes so that hot air may be carried equally to the different rooms on all floors?

5 5. What is the average temperature of the surface of a hot-water radiator when the system is working properly on a cold day?

25 6. State the reason why a hot-water plant cannot be piped similar to steam. That is, what precautions are necessary to ensure that all radiators may obtain an equal supply of water?

20 7. What is meant by the water line of a steam boiler and what relation must it bear to the positions of the supply and return mains for the proper working of a gravity job?

20 8. What is a false water line in a steam heating job and is it a satisfactory method of overcoming differences in levels?

5 9. What is the usual pressure on the boiler of a first class gravity system of heating?

10 10 What is meant when it is stated that a building is heated by (*a*) exhaust steam
(*b*) live "

10 11. In piping a building for heating by exhaust steam what precaution must be taken as to the position and size of the steam main?

5 12. What service is performed by a Nason steam trap?

5 13. What service is performed by an Albany steam trap?

5 14. What is meant by the one pipe system of piping?

5 15. What is the cause of noise, etc. in a steam plant and how may it be avoided?

5 16. In a two pipe system of steam heating in what direction should the main steam supply fall?

10 17. Should the safety valve on heating boiler have a lesser or greater opening than on a high pressure boiler?

5 18. What is the object of a check valve on the main return?

10 19. Which is the better method to carry the return mains under the floor or above? State seasons for your reply.

25 20. What should govern the amount of heating surface to be placed within any room to be warmed?

5 21. Is any moisture given off to the air of a house by a hot water or steam heating plant?

VENTILATION.

10 1. What is the usual method of detecting impure air?

10 2. Why does a column of air pass up or down a flue?

5 3. When should an out-let register be placed in a room heated by hot air?

10 4. Does impure air rise to the ceiling, drop to the floor or does it do either?

5 5. What is the highest speed at which air can be brought into a room without causing a draught?

15 6. Is one opening out of a room for ventilation purposes better than two or more openings or not?

5 7. What is meant by upward ventilation?

5 8. What is meant by downward ventilation?

10 9. Which is the more satisfactory and why?

20 10. What amount of floor area and cubic space should be allowed in a school room per pupil?

Sanitary Science.

FINAL.

Values.

25 1. State briefly the general sanitary principles which govern the present system of plumbing work.

25 2. State what are the conditions governing the proper drainage of a house where waste, subsoil and roof water must be disposed of.

25 3. Draw on the accompanying plan the different drains which you would put down to drain and carry off all waste products of a house including subsoil and rain water.

5 4. What is the weight of extra heavy soil pipe?

5 5. Why is it necessary that soil pipe should be heavy?

10 6. What provision would you make for running the waste water from a refrigerator?

5 7. What is meant by the water test as applied to plumbing pipes?

5 8. What is meant by the smoke test as applied to plumbing pipes and fixtures?

15 9. How would you dispose of the waste matter from the plumbing system of a country house.

15 10. Give a sketch of a cesspool suitable for the reception of the matter of a country house.

10 11. State the advantages and disadvantages of back venting traps in plumbing work.

10 12. State the advantages and disadvantages of a breathing pipe.

10 13. How should a urinal be set up in a semi-public place?

15 14. Describe the best method of setting up plumbing fixtures in a private house.

10 15. How should the waste pipes of a plumbing system be set up?

15 16. What measure would you take to prevent any danger to health arising through emanations from the ground beneath a house?

15 17. What are the causes of damp basements in clay soil and how would you provide against such dampness?

15 18. What is an earth closet and what are its advantages and disadvantages?

10 19. What is an anti-syphon trap and what are its advantages?

10 20. How may a trap become unsealed?

10 21. What constitutes a good trap?

The Elements of Building Construction.

SIRST AND FECOND INTERMEDIATE.

APRIL 8TH.

MR. E. BURKE, *Examiner*.

NOTE: *In 1st intermediate 110 marks will be the greatest number obtainable and 50 per cent. the minimum to pass. In the second intermediate 130 marks will be the greatest number obtainable and 50 per cent. the minimum to pass. The Questions enclosed in brackets are not required of the first intermediate students.*

Values.

10 1. Draw to scale of ½″ to the foot a section of a rubble stone Cellar wall 18″ thick, showing footing course in proper proportion. Show how wall is built in Section and Elevation and indicate description of work in writing upon the drawing.

10 2. Draw to 1″ scale plans of two Successive Courses of a one and a half brick wall at the angle of a building showing Flemish bond on exterior and English on interior face.

15 3. Sketch in Elevation a random coursed wall of squared rubble having a rockfaced plinth, quoins with margin draft and weathered coping. Also sketch section showing bond.

25 4. Show Elevation of a window to ½ inch scale 3′0″ wide 6′0″ high in a one and a half brick wall with Segmental Arch—one half the arch to be "bonded" 1½ brick in height and the other to be "rowlock" same height. Indicate on the elevation in a series of four courses each, three different kinds of bond. [Show ¼ full size section of jamb, head and sill. Sashes to be hung with weights.]

10 5. Show a flat stone arch over a 4 ft. opening with the stones joggled. What is a cramp?

10 6. Sketch a Scarf Joint 3′0″ in a 6″ x 8″ timber. [Show plan and elevation and fastenings of a beam spanning 22 ft., the largest timber available being 3″ x 12″, stuff 16 ft. long, beam to finish 9″ thick.]

25 7. Show Section of a brick trimmer-arch with trimmer joints, flooring and deafening.

15 8. Draw Section to ¼″ Scale of a King-bolt roof-truss, having a span of 30 ft. Indicate the names of the different members.

10 9. Sketch section of Gutter and Eaves, wood or metal, suitable for the Canadian climate.

10 10. Sketch section of flat roof, (felt or gravel), at parapet wall and method of flashing.

10 11. Show a section, to a scale of 2″ to the foot, of jamb and

sill of an external door in 1½ brick wall, the frame being 6x4, and the door 1⅜ thick, pannelled on the outside and bead flush on the inside.

17 12. What is understood by the terms: beam filling, brick-nogging, damp-course, bats, corbelling, grouting, template, parging, deafening, strapping, plugging, housing, morticing, tenoning' bridging, key (in plastering), wiped joint.

Nature and Properties of Materials.

FINAL.

APRIL 8TH.

MR. E. BURKE, *Examiner.*

NOTE: *80 marks will be the maximum number of marks possible to be obtained and 60 per cent. the minimum to pass.*

Values.

12 1. Name the source and method of obtaining lines. Name two different kinds and the nature of each.

12. 1. In building a wall in a damp situation what should be the composition of the mortar? and why?

10. 3. What are the uses of Concrete and what is its composition.

12 4. Name at least four different species of stone in general use in buildings and the distinguishing composition and qualities of each.

10 5. Name the distinguishing features of a good brick.

10 6. Name at least five kinds of roof coverings and the relative advantages and disadvantages of each.

12 7. What are the principal merits of cast and wrought iron? and in what way are they most effectively employed?

10 8. Describe the character of a good quality of timber for building purposes.

12 9. Name two kinds of glass and wherein are they different What is the composition of good Oil Paint and of Varnish.

Technical Terms.

FIRST INTERMEDIATE.

NOTE: *100 marks will be considered a full paper.*

Values.

50 1. Define: Abacus, Fillet, Acanthus, Verge-board, Boss Coping, Voussoir, Cavetto, Chamfer, Architrave, Base Coping, Aisle Crockets, Mullion, Extrados, Console, Patua, Groin, Dais, Clere-storey, Transept, Surbase, Beak-head, Astragal.

10 2. What is a Chamfer Stop? Sketch one.

15 3. What is a Rose Window? Sketch one.

20 4. Sketch, roughly, any Gothic Roof principal, and name the various timbers.

10 5. What do you understand by a Broach Spire?

25 6. Describe the main features of any Church you know, using the proper technical terms for all parts.

20 7. Sketch a Classic Conice, and give the pioper names to each member.

SECOND INTERMEDIATE.

APRIL 8TH.

S. H. TOWNSEND, *Examiner.*

NOTE: *100 marks will be considered a full paper.*

Values.

15 1. What is a Corbel Table?

50 2. Define: Cyma-recta, Fillet, Surbase, Gargoyle, Torus, Transept, Abacus, Mullion, Apse, Console, Flamboyant Bowtill, Voussoirs, Crockets, Achlar Annulet, Triglyph, Extrados, Boss, Caryatides, Clere-storey, Dais, Cavetto, Architrave, Astragal.

15 3. What are Chamfer Stops? Sketch one in the Norman and one in the Early English style.

20 4. Sketch three examples of Norman Plain Mouldings and name the members.

25 5. Describe any Church you know, using the proper technical terms wherever possible.

25 6. Sketch roughly a Column and Entablature in any order. Name the order, and each of the members.

FINAL.

APRIL 8TH.

S. H. TOWNSEND, *Examiner.*

NOTE: *100 marks will be considered a full paper.*

Values.

10 1. What do you understand by "long and short work?" Sketch an example and say where and when it was used.

35 2. Define: Tympanum, Trefoil, Echinus Apse, Cusp, Label, Mitre, Bowtill, Flamboyant, Corona, Console, Donjon, Cyma-recta, Fillet, Surbase, Squint, Throating, Torus, Gargoyle, Transept, Squinch, Extrados, Abacus, Modillion, Caryatides Dais.

10 3. What is a Broach Spire? Sketch one.

20 4. Of what members do Norman Plain Mouldings consist? Sketch three examples of Norman enriched mouldings, and give the proper name to each.

10 5. What is an "Impost"? Sketch one.

10 6. What is a Rose window?" Sketch one.

20 7. Sketch a column entablature in any of the Greek orders, and name the members.

10 8. What is a Corbel Table? Sketch one.

25 9. Describe the roof and main entrance door of any Church you know, using the proper technical terms and names for all mouldings, fixtures, etc.

ILLUSTRATIONS.

RESIDENCES ON DORCHESTER STREET, MONTREAL, FOR MESSRS. SHEARER AND BROWN.—WRIGHT & SON, ARCHITECTS.

The above houses are situated on the corner of Dorchester street and Atwater avenue, and the view is taken up on Atwater avenue, looking on the front on Dorchester street. They are built of Nova Scotia red sandstone furnished and built by Mr. J. H. Hutchison, contractor.

They are lined on the front with terra cotta blocks.

In the plumbing the very best materials have been used, and all is fitted up very complete. The buildings are wired for electric light.

The flat portion or hollow roof is covered with Sparham cement and the mansard with best red slate, cut round. Firewall, covering, nosing, etc., are all cold rolled copper, as well as all the hip rolls and terminals.

The ground floors are finished in oak, the first floor in whitewood and the balance in pine. All the interior detail is made to correspond with the interiors tone work. The front is richly carved.

The contractors for the work were as follows: Masonry, J. H. Hutchinson; carpentering, J. Shearer; plastering, P. C. Wand; plumbing and electric wiring, Robt. Mitchell & Co.; roofing, Campbell & Co.

PHOTOGRAVURE PLATE—ST. ANDREW'S CHURCH, TORONTO.—W. G. STORM, ARCHITECT, TORONTO.

HOUSE IN ROSEDALE.—E. B. JARVIS, ARCHITECT, TORONTO.

ALEXANDRIA SCHOOL FOR GIRLS, EAST TORONTO.—HENRY SIMPSON. ARCHITECT, TORONTO.

HOW TO ESTIMATE.

BY W. H. HODSON.

Following is a portion of the balance of the specification and bill of quantities accompanying the drawings of Baptist church, Walmer Road, Toronto, published in the CANADIAN ARCHITECT AND BUILDER for May. The remaining portion will appear in our next issue:

CARPENTER AND JOINER WORK.

Provide and fix all necessary centerings and turning pieces, none to be removed until authorized by the architects. Provide cambered lintels 6 in. in depth by the thickness of wall where required. Framing lumber to be of good white pine free from large or loose knots, shakes or other imperfections and to hold the full sizes shown or specified when fixed in the building. The portion showing below plaster line must be carefully selected free from dark knots, stains and cracks. The joists and rafters may be of sound well seasoned hemlock. The joiners' work to be executed (unless otherwise specified) with good quality of clear and well seasoned white pine lumber suitable for carving. The woodwork of front of platform and baptistry, panelling and tracery at back of platform, gallery front and casing of gallery beam, vestibule screw and the doors and jambs in auditorium and front vestibule, and strings of stairs to be of well seasoned black ash, kiln dried, and of best quality. The turned pillars in gallery front to be of black birch. The carpenter to hoist and set the iron columns and girders which will be delivered at the building by founder, who will assist carpenter in putting columns together, supplying and fixing the necessary bolts and doing any drilling required. Board over stone sills and weathering as soon as set. Provide seasoned slips 2½ × ⅜ in., to be laid on walls under bearings of joists, and elsewhere as required for fixing trimmings and at every 2 ft. in height of dressing room and vestry outer walls to which to nail battens &c., and provide all necessary wood, bricks, &c. Batten outer walls of vestry and dressing rooms with 2 × 1¼ batten at 16 in. centers (walls of church and vestibules will be finished in brick). Ground floor joists to be 12×2 in. at an average of 16 in. centres resting on walls, and on 10×12 in. beams. Beams to rest on walls and on brick piers, joists of porch, rear vestibule, dressing room and vestry, 10×2 in. at 16 in. centers. Gallery beams to be composed of ten 12×⅞ dressed boards breaking joint and well nailed. Gallery joists to be 10×2 at 16 in. centres; outlooks of same 2×6 in. Form rising plates wi h 2×4 in, stuff as shown. The rear gallery beam is to be carried in four dressed and chamfered brackets as shown; brackets to rest in stone corbels, and to be bolted to walls with ¾ in. bolts built into brick and well anchored. Deck joists of vestry &c., to be 10×2 at 16 in. centres, made up with 2 in. stuff to form slope of ½ in. to the foot. Form curves for skylight with 2 in. stuff 10 in. above roof, and line in inside with narrow matched and jointed sheeting with bend at ceiling line and moulding at top. Trimmers at stairs, flues, windows, &c., to be 4 in. thick. Put a course of 2×2 in. bridging between each bearing. Joists of tower to be 12×2 at 16 in. centres, The run beams or plates of main roof resting on iron columns to be formed with five thicknesses of 2×10 in. stuff breaking joint, and in lengths to span two bays—to be well spiked with 6 in. wrot. iron spike at 3 ft. spaces with double ⅜ in. wrot. iron bolts at all joints. Walls of clere story to be formed with 10×2 in. studding at 16 in. centres, resting on 6×10 in. dressed and chamfered beams cutting in between iron columns. Plate above this beam receiving ends of aisle rafters to be 2×10 in. spiked to studding wherever practicable; the framing timbers may be made up to several thicknesses of stuff instead of being solid. In such cases joints must be properly broken and work thoroughly spiked and bolted. Principal rafters. collars, tie beams, queen posts and wall pieces to be of the sizes figured on detail sheet, dressed and stop chamfered or turned and moulded as shown. Purlines 6×8 in., checked into principals and stop chamfered. Ribs on ceilings forming panels to be 2 in. thick, rounded at angles, curved ribs to be made up of several thicknesses of stuff, breaking joint and well glued and nailed. Carpenters to supply and fix all the bolts, straps, iron rods, nuts, washers, stirrups, &c., in connection with the framing of roof and as directed. Common rafters and collars 6×2 in. at 16 in. centres, collars to be well spiked to rafters. Rafters of pinnacles to be 4×2 secured to 4×4 in. mast, built into brickwork. Case the run beams &c., with ⅞ in. stuft, forming frieze having angle moulding as shown. Form moulded cornices in wood cutting in between principals. Put moulded fillets or cornices wherever necessary at junction of wood or plaster work with finished brick walls.

Roofs, sloping and flat, to be sheeted with ⅞ in. matched boarding well nailed to rafters in widths not exceeding 8 in. laid to break joint. Put proper 3 in. rolls to ridges. Eaves and gables to have ends of rafters dressed; dressed and beaded soffit, dressed facia and moulding against wall. Eaves of pinnacles and buttresses to be moulded as shown. The foul air trunk connecting galvanized iron vent tube in loft of church to tower to have 6×2 joists, 4×2 studding and rafters; walls and roof to be boarded for slating, soffit to be sheeted with ⅞ matched and V jointed stuff, and floor laid with ⅞ in. matched stuff; hinged hatten door in east side fastened with good bolt. Provide a valve in the same of light stuff, hinged at top and worked with rope and pulleys from gallery stage of tower. Carry this duct with matched sheeting into belfry as shown, and form small door, hinged and bolted, in the same. Sheet walls of clerestory on outside with ⅞ matched stuff. Lay ground gallery floors with good quality of well seasoned ⅞ in. grooved and tongued boarding, blind nailed to joists

and properly cleaned off on completion, boards not to exceed 4 in. in width. Form steps at gallery passages. Partitions shown on plans by a yellow tint to have 4×3 in. heads and sills, common studs 4×2 at 16 in. centres; door posts 4×4 in.; braces 4×3 in. Truss partitions where necessary. Stairs in tower and N. E. staircase to have 1¾ in. close strings, beaded, with moulded capping and string mould, 1½ treads, rounded nosings, cavetts, and fillet, ⅞ in. risers, 7×6 in. turned red oak newels, 5×3 in. moulded red birch rail, and 1¾ in. turned birch balusters. Stairs in tower from gallery level to next stage to be generally similar, but with 5 in. newels and 4×3 in. rail. Enclose at head with ⅞ matched and jointed sheeting with panelled door hung with 4 in. butts and finished with good mortice lock and porcelain and plated funiture. Stairs to have all necessary carriages, brackettings, &c., &c., complete; sheet soffit of stairs with narrow and jointed stuft. Stairs to basement to have 1¾ treads, no risers, rounded nosings, 1¾ strings, rounded rails. Stairs to tower belfrey from upper floor to have 1¾ strings and treads, rounded rail and 4 in. newels. The windows of vestry and dressing rooms to have proper boxed frames with all necessary lines, weights &c., 1¾ in. moulded sashes fastened with Berlin bronze automatic fasteners and furnished with brass ring window lifts. All basement windows to be protected by wire guards of stoutest wire well secured to frames. Windows of church tower, vestibules, &c., to have solid moulded and rebated frames with stops to secure lead lights and beaded fillets outside and inside as shown, ventilators and gablles to have chamfered frames and ⅞ in. louvres. Put hinged batten doors on inside, fastened with bolts. The doors to basement area to be 1¾ in. thick bead and butt huug with 6 in. butts and furnished with two 8 in. barrel and two 8 in. square bolts to each leaf; provide strong hooks. Frame 4×6 chamfered and rebated 2 in. rounded oak sill. Door at back of west porch to be 1¾ panelled and champered, hung with 5 in. Berlin bronze butts, furnished with 5 in. good mortice lock, bronze knobs—4×6 chamfered and rebated frame, 2 in. oak sill. The entrance doors on east front to be of oak 2⅜ in. thick, panelled as shown, with rounded stiles and raised panels. Doors to be hung with 3 best 6 in. butts to each leaf, furnished with heavy square bolts to both leaves, and ecclesiastical escuteheons and drop handles of selected design. Provide and set also ornamental cast iron hinge plates according to detail; frames to be rebated and moulded with stiff bead and moulded tracenid fanlights with stop to secure glass. Provide heavy wrot. iron hooks to hold doors open. The swing doors immediately inside of the foregoing to have moulded frames finished above with crwon mould. Doors to be 1⅜ in. thick, panelled, moulded, veneered with black ash and prepared with stops for glazing; to be hung with Chicago double action spring hinges, nickel plated, and furnished with 12 in. polished copper finger plates, both sides. The other swing doors from vestibule to tower and staircase to be similar, also that from rear porch to vestibule, except that the latter will be of pine and will have japanned hinges and porcelain finger plates. The swing doors opening into gallery will be similar to those in front vestibule, but without glazing. The external doors of porch at rear of church to be ⅞ in. matched and beaded boarding 2⅛ in. framed and chamfered stiles and 1¾ inch back-rails, hung with three pairs of 5 in. butts to 4 in. rebated and chamfered frames, having 2 in. oak sills, and furnished with 8 in. spring and 10 in. barrel bolts and best heavy rebate mortice locks and 2 in. bronze knobs. Fasten back doors with strong brass hooks and eyes. Doors from church to rear vestibule to be 1¾ in. panelled and moulded, to be hung to moulded and rebated with two strong 5 in. Berlin bronze spring hinges to each leaf, and furnish with best 5 in. mortice locks, heavy copper bronze handles on one side, and copper iron finger plates on the other; standing leaf to have 12 in. bronze flush bolts, and strong hooks to hold both leaves open. Doors from church to vestry to be generally similar, but hinges not to be spring. Substitute also bronze knobs for handles and finger plates. Doors from front vestibule to church to be similar to those to rear vestibule in every respect, but prepared for glazing. Doors opening on to platform to be hung with three 4 in. Berlin bronze hinges to each and furnished with best 4 in. mortice locks, copper bronze knobs and furniture. All hardwood doors to be veneered. The doors in vestry and dressing rooms to be 1¾ in. panelled and chamfered, hung in proper rebated and beaded frames with 4 in. Berlin bronze butt hinges, and furnished with good 4 in. mortice locks, brass bolts and keys, porcelain and plated furniture. Doors in plastered partitions to have ⅞ in. simply moulded architraves 4½ in. wide with band mould. Walls on ground floor leading to dressing rooms and vestry to be sheeted to height shown with ⅞ in. matched and V. jointed sheeting of the best quality, in widths not exceeding 4 in., blind nailed to grounds, and finished with moulded capping. Dressing rooms, lavatories and vesrry to have 8 in. moulded ⅞ base and 5×⅞ moulded chair rail. Put fillet at junction of floor and base. Vestibule screen to be according to details, to have moulded posts or frames, boxed for weights. Dado of 2½ in. x ⅞ matched V jointed sheeting, double, forming pocket into which sashes may slide; sashes to be 2⅛ in., prepared with stops for lead glazing, hung with the very best sash cord over heavy brass pullies and heavy weights, and bronze lifts as required. Form baptistry with proper studding and joisting, and sheet floor and sides with narrow matched stuff; curb to be moulded with moulded capping—proper detached solid steps in baptistry. Form turned and moulded columns at baptistry with moulded cornice, traceried pannelling, &c., as shown, Pulpit platform to have 6. in by 2 in. joisting on proper supports—floor as church—front to be of panelling as shown, with rounded stiles and moulded capping and base. Put steps to platform as shown. Gallery front to be according to detail; turned balusters and tracried panels will be of black birch, also turned portion of newels at foot of stairs to platform. Provide and fix cut iron brackets on stays at about 5 ft. space well secured. The traceried panels will be at about 10 ft. centers. String mould rail balustrade of stairs from gallery to platform to be a continuation of gallery front as shown; form proper carriage and bearers of these stairs and prepare for plastering. Steps at side entrance to be 2 in. by 3 in. slatted and dressed 3 sides, 2 in. strings resting in cedar bearers, slat walk in front of same of similar stuff in cedar sleepers and having rounded curb. Partitions in lavatories to be of ⅞ matched V jointed sheeting 7 ft. high in 3 in. widths, finished with capping. Doors to be kept up 6 in. from floor, to be panelled and furnished with brass bolts and hung with 3½ butts. Plumber will supply seats of closets. Partitions forming dressing doors to be similar but extending to ceiling. Cope areas with 1¾ in. bevelled plank secured to brick work with ⅜ in. bolts 2 ft. long. Trim for registers and cut for steam fitters, pipes, &c., as required. Form side of coal bin with 2 in. plank on proper girth. Allow the sum of $100.00 for contingencies which will be deducted at final settlement if not required. Attend on other trades as required in the execution and for the perfect completion of the work.

IRON FOUNDER.

The iron columns to be delivered at the building, and the carpenter will hoist and set the same, assisted by founder, which will do any necessary fitting, drilling for bolts and supply all connections, fastenings and bolts. All bearings to be turned and columns to have top and bottom plates where required. Provide two basement columns under pulpit platform 4 in. diam. ½ inch metal. Provide six columns under gallery 4 in. diameter ⅝ metal, having moulded caps and shaft enriched with a diaper pattern of approved design. Provide and fix on ground floor eight columns, 10 in. diameter, ¾ metal, having diaper pattern as above. Caps will be of plaster. The second stage of column will be (○) shaped 10 in. diam. ¾ metal. Caps will be of plaster, as shown. The third stays of column will be + 10 in. diam, 1 in. metal. All to have the necessary brackets, bolts, stays, &c., according to detail. Gallery front will be of wood. Provide and set across baptistry recess one 12 in. I beam, 22 ft. 6 in. long, weighing 40 lbs. to the foot, and one 6 in. I beam 11 ft. long weighing 16 lbs. to the foot to carry back wall of organ recess. Provide and set two pairs of rolled iron girders across openings under gallery at tower and stair case, each girder to weigh 21½ lbs. to the foot and to have yokes and bolts with ornamental washers. Drill for screws securing wooden fillet on soffit to cover gap.

GALVANIZED IRON.

All the main eaves of nave and aisles to have 5 in., and eaves of tower, vestibule and staircase and vestry building square formed No. 28 galvanized iron, gutters properly secured to facias with wrot. iron brackets ⅛ × 1 in. and stiffened with 7/16 × 7/16 wrot. iron bars in best manner. Put fifteen 3 in. octagon galvanized iron down pipes properly connected at eaves with gutters and at foot with drains 1 ft. below surface, and having proper caps to pipes; secure to wall with ornamental wrot. iron hold fasts not more than 8 ft. apart. Put two stacks of similar pipes to tower eaves to waste on main roof and put 2 in. branches from the gutters in the other two sides connected to the 3 in. pipes. Flash at walls of church at deck of vestry building with galvanized iron 10 in. wide let into joints of brickwork cemented and turned down over felt. Cover wreathing of projection well on west elevation with No. 28 galvanized iron, lapped tacked and soldered. Provide and set glazed with rough plate two galvanized iron skylights having ventilators with valves opened by cords and pulleys. Provide and set on ventilating openings in ceiling of church ornamental register gratings and carry from the same to box near tower No. 28 galvanized iron ducts of sizes shown, carefully stayed and made secure and tight. Cover belfry floor of tower with No. 28 galvanized iron, lapped, tacked and soldered, and line with scupper and shoot to waste over church roof. Carry the iron 9 in. up on to wall and cement into joints of brickwork. Put galvanized iron shield in front of duct opening over roof of N. E. staircase held in place by wrot. iron brackets.

SLATER.

Line valleys with galvanized iron 15 in. wide. Cover saddle at back of tower with No. 28 galvanized iron carried up 2 ft. on to roof of church. Cover ridge rolls. Flash under sill pieces at junction of clear-storey walls, aisle roofs. Cover the sill pieces also and carry the iron well up behind in all tiles—say 5 in. Step and cloak flash at chimneys, tower, gables, &c. as required. Cover walls as shown and roofs of pinnacles, tower and stair case, with hard burned dark red tiles of best quality (Ontario or Toronto Pressed Brick Co's.) of patterns to be selected. Form hips at tower and pinnacle roof and provide and set terra cotta finials as shown bolted with iron rods to wood work of spire, &c. Cover the other sloping roofs with medium sized Canadian slates from the Rockland quarries laid on heavy felt. Put a double course at eaves. Slate the weatherings in west elevation, also the walls and edge of gangway to tower. Cover flat roof of vestry building with best felt pitch and gravel roofing, guaranteed for five years in writing. Repair and make good after other trades and leave all perfect and complete.

BILL OF QUANTITIES.

CARPENTER AND JOINER WORK.

	$ c.
6,600 ft. of pine timber (board measure) in beams, purlines, plates, etc.	
25,300 ft. of hemlock timber (board measure) in joists, rafters	
11½ squares (100 ft.) of 2″x1¼″ battening, outer walls of dressing room and vestry	
12 squares (100 ft.) of 10 in. x 2 in. studding, clear story	
50 squares (100 ft.) of 2 in. ribbed work, in roof, ceilings, forming panels, curved at angles	
72¾ squares of ⅞ matched roof sheeting, 8 ins. wide	
9 squares of ⅞ matched sheeting to clear story	
1¾ squares of ⅞ matched floor	
1½ squares of ⅞ matched and v jointed sheeting	
120 lineal ft. of platform fronts, best quality black ash, kiln dried	
72 lineal ft. of baptistry panel work, tracery and gallery front, kiln dried	
24 lineal ft. of casing gallery beam	
262 lineal ft. of run beam on iron columns, 5 thicknesses 10 in. x 2 in. and ⅞ freize casing, bolts spiked, etc.	
262 lineal ft. of dressed chamfered 6 x 10 beam	
160 lineal ft. of forming cornices mould at principals, and junction of wood work and plaster at brick wall	
232 lineal ft. of 3 in. rolls to ridges	
430 lineal ft. of dressed eaves and beaded soffit, etc.	
147 lineal ft. of pinnacle dressed eaves	
12 black ash doors and jambs, auditorium, vestibule, etc.	
5 pairs roof principals wrought and moulded, as per section	
10 pairs roof principals smaller, wrought and moulded to aisles	
1 hinged door in tower floor bolted	
1 valve hinged and with ropes and pullies, to belfry, and with small door hinged and bolted	
173 stair steps finished, etc., as specified, different widths, strings black ash and open treads to basement	
4 black birch turned pillars, gallery front	
4 dressed and chamfered brackets to gallery beam, on stone corbels, ¾ iron bolts in brick wall, anchored	
11 rows of 2″x2″ bridging	
Provide and fix centres, etc., throughout, provide cambered lintels. 6 in. wall thickness, hoisting and setting 16 iron columns, 6 beams and girders, to receive assistance from iron founder	
Boarding over stone sills and weathering, etc., as required	
8½ squares of ⅞ in. G and T gallery floors, 4 in. wide, stepped at passages	
34 squares of stud partition, trussed where necessary	
7½ squares of 4 in. x ⅞ in. v jointed wall sheeting mould, capped	
30 lineal ft. of vestibule screen mould frame boxed for weights, etc., complete	
192 lineal ft. 8 in. mould base and chair rail	
78 lineal ft. ⅞ in. matched v jointed sheeting, double for pocket to slide sashes, complete	
28 lineal ft. dado, 2½ in. x ⅞ in. matched, v jointed, 7 ft. high, capped part up to ceiling, complete	
40 lineal ft. of area coping, 1¾ in. bevelled plank	
1 panel door head of tower stair complete, as specified	
2 1¾ in. doors to basement area, bead and butt, hardware, etc., complete	
1 1¾ in. paneled door, west porch, hardware, etc., complete	
2 2⅜ in. oak entrance panel, and fanlight door, double hardware, etc., complete	

2 1⅜ in. swing entrance panel door veneered with black ash, hardware, etc., complete - - - - - $ c.
2 2¼ in. rear porch door, framed and filled with ⅞ in. matched and beaded boards, hardware, etc., complete - -
6 1¾ in. panel doors, from church to rear vestibule, for glass, vestibule to church and vestry, finer plates, hardware, etc. complete - - - - - - - -
2 platform doors, hardware, etc. complete - - -
4 1¾ panel doors in vestry and dressing room, complete -
4 doors to lavatories 6 in. up from floor, etc.. complete -
7 basement doors and 1 large borrowed light, hardware, etc., complete - - - - - - - -
4 sliding doors, per plans, hardware, etc., complete -
7 2¼ sashes, stops for lead glazing, sash, cord, pullies, weights, etc., complete - - - - - - -
6 2⅛ sashes over same, south elevation - - -
4 windows (English) to vestry and dressing room complete -
7 windows, church towers and vestibules, stops for lead lights and heads, fillets inside and out, ventilator, etc., complete -
25 basement windows and wire guards complete - -
36 clere story windows complete - - - - -
1 large briel window, north elevation, complete - -
1 pulpit platform, panelling round stiles, mould cap and bases, steps, etc., complete - - - - - -
1 2 in. plank coal bin - - - - - - - -
Trimmers for registers, and cut for steam fitters pipes, etc., attend on other trades and leave work complete - -
Straps, iron rods, nuts and washers, stirrups, bolts, spikes, etc., in the above work as specified - - - -
Add $100. for contingencies, (if not required deducted at final)

NOTE.—Beginning with bearing timbers, (undressed) the measure, thus: joist 30 ft. x 10 in. x 3 in.=equal to 6 ft. 3 in. cube—to bring into board measure; multiply by 1 (for a foot square) gives the board measure 75 feet. Flooring, roof boarding, studding, furring, &c., measured length and breadth, thus: 25 ft. x 16 ft. gives=400 ft., equal to 4 squares of 10 ft. x 10 ft. Lineal measure of running feet applies to cornices and dressed work generally, the sizes stated either in quantities or specification. Items in numbers, such as doors, windows, &c., as above.

IRON FOUNDER.

2 ½ in. metal columns under pulpit platform 4 in. diameter - $ c.
6 ⅝ in. metal columns under gallery moulds and ornaments 4 in. diar - - - - - - - - -
8 ¾ in. metal columns on ground floor, 10 in. diar, caps and plinths - - - - - - - -
1 beam 22′ 6″ long, 40 lbs. to the foot - - -
1 beam 11′ 6″ long, 16 lbs. to the foot - - -
2 pairs rolled iron girders 21½ lbs. to the foot - -
Yokes, bolts, ornamental washers, drill for screws, etc., as required - - - - - - - -

GALVANIZED IRON WORK.

577 lineal ft. of 5 in. No. 28 G. iron gutters, branches, etc., complete - - - - - - - -
380 lineal ft. of octagon G. iron down pipes, 3 in. - -
150 lineal ft. of No. 28 G. iron ducts, stays, etc. - -
2 squares (100 ft.) No. 28 G. iron covering, belfry floors, cemented, and shoot to over church roof - - -
2 galvanized iron skylights, ventilators opened by cords and pullies
4 ornamental registers, gratings to ventilating ducts -
1 G. iron shields to duct opening and brackets complete -
Flashing to walls at duct, and projections lopped, tucked and soldered - - - - - - - - -

NOTE.—The measurements for this work as given above, lineal.

SLATER.

19¾ squares (100 ft.) dark red tile covering walls, roof of pinnele, etc., approved - - - - - - $ c.
75 squares (100 ft.) Rockland slating on 1 ply tarred felt -
50 lineal ft. G. iron valleys, 15 in. wide - - -
140 lineal ft. flashing clere story covering sills, etc., -
152 lineal ft. of step and cloak flashing, chimnies, tower, gables, etc., complete - - - - - - -
100 lineal ft. of slate weathering, west elevation - -
1 saddle covered with G. iron at tower - - -
1 terra cotta finial bolted to wood work - - -
Repairing and making good after other trades - - -

NOTE.—Measured, and contents given in squares, before mentioned lineal measure, also, and the sizes as above.

HYDRAULIC CEMENTS—NATURAL AND ARTIFICIAL, THEIR COMPARATIVE VALUES.

(Continued from May Number.)

To be sure, the Portland costs twice as much, but it tests twice as high; therefore it is to be expected to cost accordingly. We are apt to lose sight of the fact that both classes of cements sells for just about the same price at the mills, and that the increased cost of Portland is due to ocean freights, duties, dock charges and importers' profit, and even the most zealous advocate of Portland cement cannot claim that these charges can, in anyway, enhrance the intrinsic value of that cement. But higher price generally means better quality and backed by the testing machine, the engineer is perhaps justified in his opinions.

The testing machine is a good thing if put to its legitimate use. It is the abuse of it that we object to. It should occupy a subordinate place. If this were thoroughly understood, all would be well, but unfortunately the resquisites to a thorough understanding of a proper use of the machine requires more time and study than it does to learn to make and test a briquette. It consists in knowing something of the chemistry of a cement; in knowing what a table of analysis means; in having a knowledge of true combining proportions, and the effect of variations therefrom. Then the testing machine becomes a valuable auxiliary, for its readings will then have taken on a new meaning. The student will find that many of the rules and regulations governing tests, that have been built up within the past few years, are unsound and need revision.

The testing machine reveals many curious freaks, and taken on the principle that "Everything is for the best." it may yet reveal to us that a cement may test too high, that this modern demand for high-testing cement and the tremendous struggle on the part of the Portland cement manufacturers to supply it, striving by every conceivable means to beat the record, is all wrong.

This may sound strangely at first, but a study of the tables of long-time tests of Portland cements, as complied by such engineers as Clarke, of Boston, and MacClay, of New York, and others eminent in the profession, reveals the rather startling fact that briquettes of neat Portland do not test as high at 3 or 4 years as they do at 1 or 2 years old. Clarke says: "They become brittle with age and are apt to fly into pieces under comparatively light loads." If this is the result with neat cement at that age, what is to prevent the same results with sand mixtures at 15 to 20 years or so? I have seen walks that were made with Portland cement concrete remain in perfect condition for 8 years, and during the ninth year go all to pieces. An examination of the broken pieces shows the concrete to be exceedingly hard but brittle.

The ten years' tests of Portland cement made by Dr. Michaelis of Berlin, show that the maximum strength was reached at the end of two years, and this point held fairly well until the end of the seventh year, but from that time until the end of the tenth year there was a remarkable falling off in values. We do not recollect ever having seen any table of long-time tests of Portland cement that did not exhibit similiar results, and it is more than probable that it may yet be shown that our natural, slow-setting American cement may, in 10 or 12 years' tests, surpass any artificial cements. The excellent condition of some of our old work, done many years ago with American cements, would seem to indicate as much.

At all events, we have no proof that the Portland is superior in matter of durability, and we do not beleive that clay and lime can be suddenly thrown together, and kept there by any skill of man, that can in any manner compare with the staying qualities as found in first-class natural cements where the clay and lime have existed in the most intimate contact for countless ages.

During the past summer the engineer in charge of the Aberdeen harbor sea works, reported a serious failure in the Portland cement concrete work at that point; after only 15 years immersion it went to pieces, while the natural cement contrete, at the *same place* and *same age*, was in good condition. He states that every care had been taken in the Portland concrete used; the cement had withstood the *mechanical tests*, and the concrete had set hard. After a thorough examination by a Board of Engineers, assisted by Professor Brazier, of Aberdeen University, it was concluded that "Portland cement cannot resist the action of sea water." The Protessor further states that "A chemical action had taken place between the sea water and the Portland cement in the concrete, causing an expansion and softening of the concrete." The harbor engineer also reported that "the Portland cement concrete entrance walls of the dock had expanded 2¾ inches in the height of the walls, and their surfaces had cracked and bulged, and the joints of the caisson Quoin-stones had opened up, causing considerable leakage."

Another case is that at the harbor of Dundee, reported upon during the past summer. In this instance the Portland cement concrete had softed in sea water and natural cement was used to protect it if possible from further distastes.

The investigations of Professor Tetmajer of the Federal Polytechnical School at Zurich, developed some interesting information. It has long been noticed in Germany that Portland cement of certain kinds, when exposed for several years to the air, loses its consistency and crumbles. This danger had become so serious that the German Minister of Public Works issued a circular in 1885, restricting within narrow limits, the use of Portland cement in work exposed to the air.

Since that time Professor Tetmajer has devoted himself to investigating this matter, and, according to his statements, the cause of the disintegration of Portland cement exposed to air is to be found in a want of proper preparation of the materials, particularly in the lack of sufficient grinding together of the chalk and clay to ensure the complete silification of the lime during the process of calcination.

But the best brands of Portland cement, which had withstood the action of water for several years, became soft on exposure to air. He says also, that "air especially attacks sharply (heavy) burnt cements, which imbibe a great deal of carbonic acid, and decay in water is caused by an excess of matters which undergo an increase in volume by nxidation and imbibing of water." The Professor found about 10 per cent. of the brands tested in this condition.

In the light of this exposition of the characteristics of both the English and German Portland cements, in the countries where they are manufactured and where they have been the longest in use, it would seem that no other or better evidence is needed to prove that artificialiy-made cements, however high they may test, are not true cements, and the people of this country who of late years, are using Portland cements with such unlimited confidence in the superiority of those brands over our own natural cements, a confidence born of the testing machine and nurtured in the belief that tensile strain can be as unerringly applied to cements as to iron or steel, may yet awaken to a sad realization of the deceptive character of such tests, for it may well be predicted that in a very few years, we shall see evidences of disintegration and decay in many of the important works now being constructed of Portland cement in this country. When we compare these early indications of decay on the part of these new-born artificial cements with the splendid record made by natural cements that have successfully withstood the action of sea water for over a century—and the still more trying action of the air for centuries—reaching nearly if not quite as far back as civilization itself, we are inevitably led to the conclusion that man has not yet succeeded in compounding the materials essential to the production of a first-class cement, that can surpass, in durability and general excellence, that which nature has so bountifully bestowed upon us.

ERRATA.

Editor CANADIAN ARCHITECT AND BUILDER.

DEAR SIR,—I find that a printer s error occurs in the description of Mr. E. A. Well's house illustrated in your last number. It should read, "The half timber framing is constructed of 2 in. x 6 in. studs," instead of 2 in. x 2 in. studs as appearing in your publication. Kindly correct same and oblige.

Respectfully yours, J. FRANCIS BROWN.

The Adamant Mfg. Co., of Syracuse, N. Y. having recently purchased the property and business of the Northwestern Adamant Co., of Minneaplis, has been reorganized with a capital stock of $500,000 under the name "Adamant Mfg. Co. of America." The new company has branches in New York, Milwaukee, West Superior and Toronto. The latter branch will continue under the same management as heretofore.

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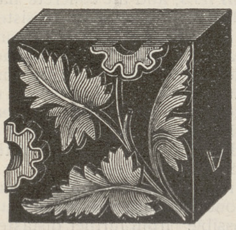

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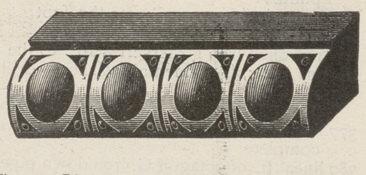

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